

WHAT IS CLAIMED IS:

1. A method for delivering a physiologically active compound to a patient comprising the steps of:

(a) heating the physiologically active compound to a temperature and for a duration that results in an acceptably low level of decomposition;

(b) simultaneously passing a gas across the surface of said compound to achieve a desired rate of vaporization; and

(c) administering the resulting aerosol to a patient.

2. The method of claim 1 wherein said gas is air.

3. The method of claim 2 wherein said air is at ambient temperature.

4. The method of claim 2 wherein air is passed across said surface at a rapid rate.

5. The method of claim 4 wherein the rapid rate does not result in a large rise in the air temperature.

6. The method of claim 4 wherein the rapid rate does not result in said compound being blown downstream with the air without being first vaporized.

7. The method of claim 2 wherein the vaporized compound is rapidly mixed into the air to cool and preclude additional decomposition of said compound.

8. The method of claim 7 wherein the resulting mixture of said vaporized compound and air is further mixed into an additional air stream to further cool and preclude additional decomposition of said compound.

9. The method of claim 4 wherein the rapid rate of air passing across said surface is caused by inhalation through the device by the patient.

10. The method of claim 2 wherein the air passing across said surface is generated by mechanical means.

11. The method of claim 1 wherein said compound is moved into a region of rapid gas movement and heated so that the said compound vaporizes at the lowest possible temperature.

12. The method of claim 1 wherein said compound is selected from the group consisting of cannabinoid extracts from cannabis, THC, ketorolac, fentanyl, morphine, testosterone, ibuprofen, nicotine, Vitamin A, Vitamin E acetate, Vitamin E, nitroglycerin, pilocarpine, mescaline, testosterone enanthate, menthol, phencaramide, methsuximide, eptastigmine, promethazine, procaine, retinol, lidocaine, trimeprazine, isosorbide dinitrate, timolol, methyprylon, etamiphyllin, propoxyphene, salmetrol, vitamin E succinate, methadone, oxprenolol, isoproterenol bitartrate, etaqualone, Vitamin D3, ethambutol, ritodrine, omoconazole, cocaine, lomustine, ketamine, ketoprofen, cilazaprol, propranolol, sufentanil, metaproterenol, pentoxapylline, captopril, loxapine, cyproheptidine, carvediol, trihexylphenadine, alprostadil, melatonin, testosterone propionate, valproic acid, acebutolol, terbutaline, diazepam, topiramate, pentobarbital, alfentanil HCl, papaverine, nicergoline, fluconazole, zafirlukast, codeine, testosterone acetate, droperidol, atenolol, metoclopramide, enalapril, albuterol, ketotifen, isoproterenol, amiodarone HCl, zileuton, midazolam, oxycodone, cilostazol, propofol, nabilone, ketorolac, gabapentin, famotidine, lorazepam, naltrexone, acetaminophen, sumatriptan, bitolterol, nifedipine, phenobarbital, phentolamine, 13-cis retinoic acid, droprenilamine HCl, amlodipine, caffeine, zopiclone, tramadol HCl, pirbuterol, naloxone, meperidine HCl, trimethobenzamide, nalmefene, scopolamine, sildenafil, carbamazepine, procaterol HCl, methysergide, glutathione, olanzapine, zolpidem, levorphanol, buspirone and mixtures thereof.

13. The method of claim 12 wherein said gas is air.

14. The method of claim 5 wherein said compound is contained in a heating-vaporization-mixing zone having a sufficiently restricted cross-sectional area to increase the rate of air passing across said compound and to achieve the desired rate of vaporization.

15. The method of claim 14 wherein the mixing zone is designed to rapidly cool the vaporized compound.

16. The method of claim 1 wherein said compound is heated with photon energy.

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17. The method of claim 1 wherein said compound is heated with resistive heaters.

18. The method of claim 1 wherein said compound is heated by inductive means.

5 19. A method for delivering a physiologically active compound to a patient comprising the steps of:

(a) heating the physiologically active compound to a temperature and for a duration that results in an acceptably low level of decomposition;

(b) simultaneously passing a gas across the surface of said compound, said
10 compound being contained in a heating-vaporization-mixing zone having a sufficiently restricted cross-sectional area to increase the rate of gas passing across said compound and to achieve a desired rate of vaporization;

(c) rapidly mixing the vaporized compound into the gas to cool and preclude additional decomposition of said compound; and

15 (d) administering the resulting aerosol to a patient.

20. The method of claim 19 wherein said gas is air.

21. The method of claim 20 wherein said air is at ambient temperature.

22. The method of claim 19 wherein the rapid rate of air passing across said surface is caused by the inhalation of the patient.

20 23. The method of claim 22 wherein the rapid rate does not result in a pressure drop across the restricted cross-sectional area of greater than about 10 inches of water.

24. A method for delivering a physiologically active compound to a patient comprising the steps of:

(a) depositing the physiologically active compound onto a substrate;

25 (b) feeding the substrate into a heating-vaporization-mixing zone while insuring a high level of vaporization by simultaneously passing a gas across the surface of said compound thereby insuring vaporization at the lowest possible temperature and shortest duration to achieve an acceptable level of decomposition;

(c) mixing the vaporized compound into the gas to rapidly cool and minimize decomposition of said compound; and

(d) administering the resulting aerosol to a patient.

25. The method of claim 24 wherein said heating-vaporization-mixing zone
5 has a sufficiently restricted cross-sectional area to increase the rate of gas passing across said compound and to achieve the highest possible rate of vaporization.

26. The method of claim 24 wherein said gas is air.

27. The method of claim 26 wherein said air is at ambient temperature.

28. The method of claim 26 wherein the rapid rate of air passing across said
10 surface is caused by inhalation through the device by the patient.

29. The method of claim 24 wherein said compound is heated with photon
energy.

30. The method of claim 24 wherein said compound is heated with resistive
heaters.

31. The method of claim 24 wherein said compound is heated by inductive
15 means.

32. The method of claim 31 wherein said substrate is a metallic foil.

33. The method of claim 32 wherein said substrate is a stainless steel foil.

34. The method of claim 33 wherein said compound is deposited onto said
20 stainless steel foil at a thickness of no greater than about 10 microns.

35. A method for delivering a physiologically active compound to a patient comprising the steps of:

(a) depositing the physiologically active compound onto a substrate;

(b) rapidly heating all of said compound to result in an acceptably low
25 level of decomposition;

(c) simultaneously passing a gas across the surface of said compound to insure:

(i) a high level of vaporization of at least a portion of said
compound, and

(ii) rapid cooling of the vaporized compound to result in an acceptably low level of decomposition; and

(d) administering the resulting aerosol to a patient.

5 36. The method of claim 35 wherein all of the compound is heated at the same rate.

37. The method of claim 35 wherein the compound is heated to the point of vaporization between 1 and 10 milliseconds.

38. The method of claim 35 wherein the compound is heated to the point of vaporization between about 10 and about 100 milliseconds.

10 39. The method of claim 35 wherein the compound is deposited onto a substrate having a surface area up to one meter square.

40. The method of claim 39 wherein the substrate is porous and allows for the passing of the gas through the substrate.

15 41. The method of claim 40 wherein the substrate is constructed and positioned in the gas stream so that said compound is vaporized into a small volume of gas.

42. The method of claim 35 wherein the compound is heated by heating the substrate on which the compound is deposited.

20 43. The method of claim 42 wherein the substrate is heated by making the substrate from an electrically conductive material and passing an electrical current through the substrate.

44. The method of claim 35 wherein the portion of the compound that is vaporized is all vaporized at close to the same rate.

25 45. The method of claim 42 wherein the substrate is made of an electrically conductive material and is heated inductively.

46. The method of claim 35 wherein the gas is passed across the entire surface of the substrate.

47. The method of claim 35 wherein the gas is passed across a portion of the surface of the substrate.

48. A device for delivering a physiologically active compound to a patient comprising:

(a) a housing having an outlet;

(b) a heating system for heating the physiologically active compound to a temperature and for a duration that results in an acceptably low level of decomposition while simultaneously passing a gas across the surface of said compound;

(c) a venturi tube having a throat containing said compound within said housing and connected to the outlet, said throat having a sufficiently restricted cross-sectional area to result in a desired high level of vaporization of said compound by increasing in the rate of the gas passing through said throat and across the surface of said compound; and

(d) an actuator operably coupled to said heater system and capable of activating said heater system.

49. The device of claim 48 wherein the compound is placed on a flat surface that is mechanically moved into said throat.

50. The device of claim 48 wherein said venturi tube has an inlet passage connected to said throat and an outlet passage connecting said throat with said outlet.

51. The device of claim 48 wherein the rate of gas does not result in a pressure drop across the venturi tube of greater than about 10 inches of water.

52. The device of claim 48 wherein the entire compound is vaporized in less than 2 seconds.

53. The device of claim 48 wherein any particular portion of the compound experiences a temperature heat up time to the point of vaporization in less than 0.1 second.

54. The device of claim 50 wherein air is the gas that enters the inlet passage and passes through said throat, said outlet passage and said outlet.

55. The device of claim 48 wherein said actuator is activated by the inhalation of the patient and drawing air through said throat.

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56. The device of claim 48 wherein said actuator is manually activated by the patient.

57. The device of claim 48 wherein said heater means for heating is an inductive heater generating an alternating magnetic field.

5 58. The device of claim 57 wherein the frequency of said magnetic field is maintained at less than 1 MHz.

59. The device of claim 57 wherein the frequency of said magnetic field is maintained between about 100 and about 300 kHz.

10 60. A device for delivering a physiologically active compound to a patient comprising:

(a) a housing having an outlet;

(b) a heating system for heating said compound to a temperature that results in an acceptably low level of decomposition while simultaneously passing a gas across the surface of said compound;

15 (c) a heating-vaporization-mixing zone containing said compound within said housing and connected to the outlet;

(d) a chamber of compressed gas having a valve and connected to said heating-vaporization-mixing zone for directing a stream of gas at said compound and across the compound's surface to result in a desired high level of vaporization of said compound by increasing the rate of the gas passing across the surface of said compound; and

20 (e) an actuator operably coupled to and capable of activating said heater system.

25 61. The device of claim 60 wherein a tube within said housing having an inlet passage connected to said heating-vaporization-mixing zone and an outlet passage connected to said outlet.

62. The device of claim 61 wherein air is the gas that is in said chamber and enters said inlet passage and passes through said heating-vaporization-mixing zone, said outlet passage and said outlet.

63. The device of claim 60 wherein said actuator is activated by the inhalation of the patient.

64. The device of claim 60 wherein said actuator is manually activated by the patient.

5 65. The device of claim 60 wherein said actuator is activated by the inhalation of the patient.

66. A device for delivering a physiologically active compound to a patient comprising:

(a) a housing having an outlet;

10 (b) a first tube within said housing through which a first gas stream is passed, having a filter at each end and containing a plurality of particles, each particle having a large surface area to mass ratio and a coating of a physiologically active compound;

15 (c) a heating system for heating said compound to a temperature that results in an acceptably low level of decomposition while simultaneously passing the first gas stream through said first tube and over the surface of the coated particles;

(d) a second tube connected to said outlet through which a second gas stream is passed and combined with a mixture of the vaporized compound and the first gas stream from said first tube; and

20 (e) an actuator operably coupled to and capable of activating said heater system.

67. The device of claim 66 wherein the particles are selected from the group consisting of aluminum oxide, silica, coated silica, carbon, graphite, diatomaceous earth, and mixtures thereof.

25 68. The device of claim 66 wherein the compound is heated by heating the gas in the first tube and then passing the heated gas over the compound.

69. A device for delivering a physiologically active compound to a patient comprising:

(a) a housing having an outlet;

(b) a venturi tube within said housing and having a throat containing said compound coated on its interior surface and connected to the outlet, said throat having a sufficiently restricted cross-sectional area to result in a desired high level of vaporization of said compound and an increase in the rate of the gas passing through said throat and
5 across the surface of said compound;

(c) a heating system for heating said compound to a temperature by discharging electrical energy through said tube that results in an acceptably low level of decomposition while simultaneously passing a gas across the surface of said compound; and

10 (d) an actuator operably coupled to said heater means for activating said heater system.

70. The device of claim 69 wherein the rate of gas does not result in a pressure drop across the venturi tube of greater than about 10 inches of water.

15 71. A device for delivering a physiologically active compound to a patient comprising:

(a) depositing a physiologically active compound onto an electrically conductive mesh or screen carrier;

20 (b) rapidly heating the carrier by passing a high current across the carrier to vaporize at least a portion of the compound, while simultaneously passing a gas through the screen thereby mixing the resulting vapor with the gas; and

(c) administering the resulting mixture to a patient.

72. The device of claim 71 wherein the carrier is a single layer of stainless steel mesh.

25 73. The device of claim 71 wherein the carrier is made of multiple layers of material.

74. The device of claim 73 wherein the stainless steel mesh is a fine mesh

75. The device of claim 74 wherein the stainless steel mesh is in the range of about 100 to about 400 mesh.

76. The device of claim 71 wherein the high current in step (b) is supplied by the discharging of a capacitor.

77. The device of claim 71 wherein the current supplied is for less than about 20 milliseconds.

5 78. The device of claim 71 wherein the current supplied is from between about 2 and about 10 milliseconds.

79. The device of claim 71 wherein the substrate is heated inductively instead of directly passing the current through the substrate.

10 80. The method for generating an aerosol comprising the steps of:
(a) heating the physiologically active compound to a temperature and for a duration that results in an acceptably low level of decomposition;
(b) simultaneously passing a gas across the surface of said compound to achieve a desired rate of vaporization; and
(c) administering the resulting aerosol to an organ or tissue of a patient.

15 81. The method of claim 80 wherein the aerosol is administered to the eye.

82. The method of claim 80 wherein the aerosol is administered to the skin.

83. The method of claim 80 wherein the aerosol is administered to the mucosa.

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